VRM USER'S GUIDE

INTRODUCTION

VRM continuously listens to both the host and console ports for commands. It executes whatever it sees and understands. VRM echoes (to the console port) everything it receives on the console port. Since VRM assigns no meaning to spaces, line feeds, and carriage returns, these can be used to format console input.

The host port is intended to be used primarily for downloading; normal console commands can be sent over the host port to effect storage into memory. VRM echoes the console input stream in the console output stream, but does not echo the host input stream (since echoing might take so long that subsequent host-input-stream commands would be missed).

Comments can be inserted in the host input stream to be echoed in the console output stream. These comments are not executed. Such comments begin with a "!" in the host input stream, and end with a line-feed character.

Upper- and lower-case characters are equivalent in VRM commands.

VRM has a rotating accumulator 4 bytes long. Any valid hex digit is pushed into the accumulator on the right, causing one hex digit to fall out on the left.

VRM also has an address register, loaded from the accumulator by command. Various commands use the address register as a parameter.

VRM normally intercepts traps and prints the trap number and other critical information. In the case of a BERR trap, VRM prints the contents of the on-board error register.

In this document a "$" preceding a number signifies hexadecimal numbers, a "byte" is an 8 bit quantity, a "word" is a 16 bit quantity, and a "longword" is a 32 bit quantity.

SWITCH SETTINGS

The eight switches on the CPU board have meaning to VRM at RESET time, and when initializing the map.

The OFF position represents "true", or "1", and the ON position represents "false", or "0".

Switch	Bit	Meaning
8	0	1 means autoboot
		0 means no autoboot
7	1	?
6	2	1 means do an XALLT command before anything else
5	3	0 means the board has a small (4MBy) map
		1 means the board has a big (16MBy) map
4	4	0 means low Multibus memory does not exist
		1 means low Multibus memory exists

VRM will take the CPU board out of boot state at RESET time iff low Multibus memory exists.

SINGLE-KEYSTROKE VRM COMMANDS

-     Store Byte

  The low-order byte in the rotating accumulator is stored at the logical address which is currently in the address register.

=   Store Word

  The low-order word in the rotating accumulator is stored at the logical address which is currently in the address register. If that address is odd, VRM will print a ? and store nothing.

L   Load Address Register

        The long-word in the rotating accumulator is loaded into
        the address register, then the rotating accumulator is
        set to zero.

N   Display Next Byte

        The address register is incremented, and then the byte
        pointed to by the address register is read and displayed.

P   Display Previous Byte

        The address register is decremented, and then the byte
        pointed to by the address register is read and displayed.

T   Display This Byte

        The byte pointed to by the address register is read and
        displayed.

J   Jump

        The user trap vectors are copied to the trap-vector
        locations ($0..3FF) iff the CPU board is not in boot
        state, then the user stack pointer, CPU registers, CPU
        status, on-board context register, and on board status
        register are restored from the monitor save area in local
        RAM, and control is transferred to the address in the
        address register.

Z   Zero Rotating Accumulator

        The rotating accumulator is set to zero.

(Display Previous BAB Buffer Entry

        The BAB buffer pointer is decremented, then the
        corresponding BAB buffer entry is displayed.

)   Display Next BAB Buffer Entry

        The BAB buffer pointer is incremented, then the
        corresponding BAB buffer entry is displayed.

> *   Display This BAB Buffer Entry
>
> The BAB buffer entry corresponding to the current BAB
> buffer pointer is displayed.

> \<break\> Step to Next Baud Rate

MENU COMMANDS

> ?   Print Main Menu
>
> X?.   Print Menu of Basic Extended Commands
>
> X?TST.   Print Menu of Diagnostic Commands
>
> X?BAB.   Print Menu of Bus Analyzer Board Commands
>
> X?ECM.   Print Menu of Error Correcting Memory Commands
>
> X?DK.   Print Menu of Disk Commands
>
> X?TP.   Print Menu of Tape Commands
>
> X?RF.   Print Menu of Rimfire Disk/Tape Controller Commands

BASIC EXTENDED COMMANDS

The character "X" initiates extended-command mode, and the
character "." terminates it. Only the last four characters
typed are interpreted as the body of the extended-command name,
so corrections can be made by typing additional characters. If
VRM does not understand the extended- command name, it will
execute nothing and print a "?".

> XMV.   Initialize Monitor Trap Vectors
>
> 1KBy is copied from the bottom of on-board EPROM to
> the bottom of logical address space. The bottom 1KBy
> of on-board EPROM contains trap vectors which trap to
> VRM. The XMV command is automatically executed at
> RESET time iff the "Multibus-memory-exists" switch
> is set.
>
> XIMAP.   Initialize Memory Map

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XLSPE.   Load Scratch-Page Entry

XBOOT.   Boot Versabug and UNIX

          You will be asked for a boot device. Primary stands
          for the primary boot block on your disk, and is the
          one you'll almost always be using. The other options
          are for booting if the primary area is corrupt. The
          next prompt will ask for the startup mode. Auto means
          it will boot all the way to multi-user (asking a few
          questions along the way.) Parms means it will ask you
          which UNIX to boot and bring that UNIX up single user.
          Generally you'll want to boot "rim45(0,6)unix". From
          single user UNIX type control D to start multi-user
          UNIX.

XBDL.   Begin Down-Load from CPU Host Port

XEDL.   End Down-Load from CPU Host Port

DIAGNOSTIC COMMANDS

Diagnostics below $200 are executed by the XALLT. command, and
at RESET time. The remaining diagnostics must be executed
individually.

Whenever a diagnostic executes, VRM will attempt to light the
red LED and print an "F" if it fails, and will attempt to light
the green LED and print a "P" if it passes.

Parameters can be delivered to a diagnostic which requires them
by typing L commands before the test name. Each L command
stacks an additional parameter.

XLLAT.   Loop on Logical Address (write and read)

XLRT.   Execute Local RAM Diagnostic (destroying save area)

XMEMT.   Execute Memory-Test Diagnostic

          use 20000 as the starting address and xy0000 as the
          ending address. Where:
            x= number of memory boards/2 (throw away the
            fraction)
            y=8 iff number of boards is odd
            y=0 iff number of boards is even

XECMT.   Test Every Error Correcting Memory Board Using
          Signature Analysis

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XONET.   Execute One Diagnostic

One diagnostic is executed. The name of the
diagnostic is taken from the address register, and the
repetition count is taken from the rotating
accumulator.

XALLT.   Execute "All" Diagnostics

All the diagnostics with test numbers less than $200
are executed sequentially. The sequence of tests is
repeated a number of times taken from the rotating
accumulator. The XALLT. command is automatically
executed at RESET time iff the "execute diagnostics"
switch is true. Diagnostics with test numbers greater
or equal to $200 either require parameters or are not
safe to execute at RESET time.

DIAGNOSTIC TEST NUMBERS

0   Check Local RAM

Local RAM is checked using a random pattern and its
complement. The test is destructive.

1   Check Context Register

All bits in the context register are checked. The
test is non-destructive.

2   Check Switches

The switches are not allowed to be all zeroes. This
is checked.

3   Check Segment Map

All locations in the segment map are checked using a
random pattern and its complement. Either a big map
or a small map is checked, depending upon the switch
settings. After checking, the segment map is
reinitialized to the identity map.

4   Check Page Map

All locations in the page map are checked using a
random pattern and its complement. Either a big map
or a small map is checked, depending upon the switch
settings. After checking, the segment map is
reinitialized to the identity map.

5   Check Timer

           An internal location in the timer chip is checked
           using a random pattern and its complement.

6   Check UARTs

           For each UART, an internal location is checked using a
           random pattern and its complement.

203   Check Status Register

           The on-board status register is checked using a random
           pattern and its complement. The test is
           non-destructive.

BUS ANALYZER BOARD COMMANDS

   XIBAO.   Initialize BAB Origin to Default

            The BAB origin (stored in local RAM) is initialized to
            its default value ($3E0000). The BAB origin can be
            changed by using the XLBAO command. The XIBAO command
            is automatically executed at RESET time.

   XLBAO.   Set Arbitrary BAB Origin

            The BAB origin (stored in local RAM) is set to the
            value in the rotating accumulator.

   XLBP.   Load Value into BAB Buffer Pointer

            The buffer pointer in the BAB is set to the value in
            the low-order 12 bits of the rotating accumulator.

   XDBP.   Display BAB Buffer Pointer

            The BAB buffer pointer is displayed.

   XBBA.   Begin Recording All Bus Cycles

            The BAB is set to record all Multibus cycles by
            setting the four enable bits in the BAB status
            register. The upper status register bits are not
            affected.

   XEBA.   End Recording Bus Cycles

            The BAB is set to record no Multibus cycles by
            resetting the four enable bits in the BAB status
            register. The upper status register bits are not
            affected.

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ERROR CORRECTING MEMORY COMMANDS

XDES.   Display Status of Every Error Correcting Memory Board

XIECM. Initialize Every Error Correcting Memory Board

DISK COMMANDS

XSDUN. Set Disk Unit Number

        VRM will prompt for the number you want as the new default disk unit number. VRM initially defaults to disk 0.

XDDUN. Display Disk Unit Number

XDSTA. Print Disk Status (from parameter block)

XDNOP. Do Disk No-op (and return resulting status)

XDPB.   Print Disk Parameter Block

XDREC. Print Disk Record

XDUP.   Spin Up Disk Drive

XDDN.   Spin Down Disk Drive

XMAPD. Map Out Defective Track

XDR.   Read From Disk

XSEEK. Disk Seek

XRID.   Read Next Sector ID on Current Cylinder/Head

XDRST. Reset Disk Drive

XDCMD. Do Disk Command (using existing parameter block)

TAPE COMMANDS

XTSTA.   Print Tape Status (from parameter block)

XTNOP.   Do Tape No-op (and return the resulting status)

XTPB.   Print Tape Parameter Block

XREW.   Rewind Tape

XBKUP.   Backup Disk to Tape

VRM will ask you for start and end cylinders. The
start cylinder for the system area is 0 and the end
cylinder is AC (hex) for a 35 megabyte disk system.
The start cylinder for the user area on a 35 Mby
system is AD (hex). A 0 will mean the end of 35 Mby
drive if entered as the end cylinder. 20C (hex) is
the last cylinder on a 35 Mby drive. (Cylinder
numbers of the file system are subject to change) To
backup a 70 Mby drive go from 0 to 202 (hex) on one
tape then repeat with 203 to 3F0 (hex). A 2400 ft.
reel of tape will hold about 40 Mby. If you have more
than one disk and you want to "XBKUP." a disk other
than disk 0, you will have to change to default disk
unit number with the "XSDUN." (set disk unit number)
VRM command. Note also that there is a "XDDUN."
(display disk unit number) VRM command.

XRSTR.   Restore Disk from Tape

This prompts for start and end cylinders just like "XBKUP."
above. The same cylinder numbers as used in the "XBKUP."
should be used.

XTR.   Read from Tape

XTW.   Write to Tape

VRM will prompt for a "Starting Bus Address" Enter a memory
address (hex) It will then prompt for an "Ending Bus Address"
Enter another memory address (hex). "Default Buffer Size"
will appear. 0 defaults to 4K bytes, anything else and the
buffer size is set to that number (hex). After you write the
tape you will want to type "XWFM." to put a tape file mark at
the end of the tape.

XWFM.   Write Tape File Mark

XTCMD.   Do Tape Command (using existing parameter block)

RIMFIRE DISK/TAPE CONTROLLER COMMANDS

XTRF.   Test Rimfire Disk/Tape Controller

XTDIF.   Test Disk Interface

XORFG.   Open Rimfire Disk/Tape Controller Gate

ALPHABETICAL LISTING OF VRM COMMANDS

(display previous bus analyzer board location

)   display next bus analyzer board location

-        store a byte

*   display this bus analyzer board location

\<break\> step to next baud rate

=   store a word

?   print main menu

J   restore and jump

L   load address register from accumulator

N   display next byte

P   display previous byte

T   display this byte

X?.   print menu of basic extended commands

X?BAB.   print menu of bus analyzer board commands

X?DK.   print menu of disk commands

X?ECM.   print menu of error correcting memory commands

X?RF.   print menu of rimfire disk/tape controller commands

X?TP.   print menu of tape commands

X?TST.   print menu of diagnostic commands

XALLT.   execute all diagnostics

XBBA.   begin recording all bus cycles

XBDL.   begin down-load from CPU host port

XBKUP.   backup disk to tape

XBOOT.   boot versabug and UNIX

XDBP.   display bus analyzer board buffer pointer

XDCMD.   do a disk command using existing parameter block

XDDN.   spin down a disk drive

XDDUN.   display the disk unit number

XDES.   display status of every error correcting memory board

XDNOP.   do a disk no-op (and return resulting status)

XDPB.   print the disk parameter block

XDR.   read from disk

XDREC.   print the disk record

XDRST.   reset disk drive

XDSTA.   print the disk status (from parameter block)

XDUP.   spin up a disk drive

XEBA.   end recording bus cycles

XECMT.   test every Error Correcting Memory board using signature analy

XEDL.   end down-load from CPU host port

XIBAO.   initialize bus analyzer board origin

XIECM.   initialize every error correcting memory board

XIMAP.   initialize memory map

XLBAO.   set bus analyzer board origin from accumulator

XLBP.   set bus analyzer board buffer pointer from accumulator

XLLAT.   loop on logical address (write and read)

XLRT.   execute local RAM diagnostic (destroying save area)

XLSPE.   load scratch-page entry

XMAPD.   map out a defective track

XMEMT.   execute memory-test diagnostic

XMV.   initialize monitor vectors

XONET.   execute one diagnostic

XORFG.   open rimfire disk/tape controller gate

XREW.   rewind the tape

XRID.   read next sector ID on current cylinder:head

XRSTR.   restore disk from tape

XSDUN.   set the disk unit number

XSEEK.   disk seek

XTCMD.   do a tape command using existing parameter block

XTDIF.   test disk interface

XTNOP.   do a tape no-op (and return the resulting status)

XTPB.   print the tape parameter block

XTR.   read from tape

XTRF.   test rimfire disk/tape controller

XTSTA.   print the tape status (from parameter block)

XTW.   write to tape

XWFW.   write tape file mark

Z   set accumulator to zero